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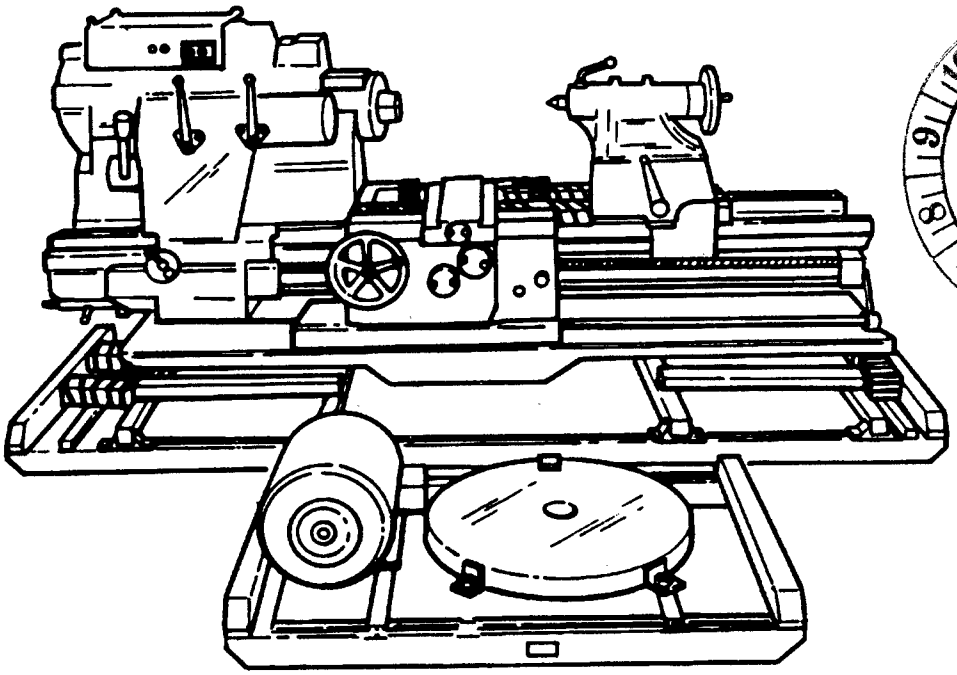

US ARMY
MATERIEL COMMAND

INDUSTRIAL PLANT EQUIPMENT

(IPE)

U.S. ARMY INDUSTRIAL ENGINEERING ACTIVITY
ROCK ISLAND, IL 61299-7260

REPORT DOCUMENTATION PAGE

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This report is an analysis of the inventory of Army-owned Industrial Plant Equipment (IPE). The purpose of this study is to examine the trends and distribution of IPE within various categories, especially age. It covers inventory trends, historical background, condition code, equipment ownership, equipment type and status, and manufacturing origin.

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DEPARTMENT OF THE ARMY
US ARMY INDUSTRIAL ENGINEERING ACTIVITY
ROCK ISLAND, ILLINOIS 61299-7260

REPLY TO
ATTENTION OF
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12 NOV 1991

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: 1991 Vintage Study of Department of the Army Industrial Plant Equipment (IPE)

1. The enclosed study provides an overview of Department of the Army IPE. It examines the trends and distribution of IPE within various categories, with emphasis on the vintage (age profile) of the equipment. The study includes:

a. Status of the inventory within the Army.

b. Comparison with industry based on the age profile.

c. Status of the inventory within AMC.

d. Inventory of Numerical Control (NC) equipment.

e. Foreign machine tools in the Army inventory.

f. Equipment replacement data.

2. The data used to prepare this study may be analyzed in a variety of ways that could be of benefit to the recipients of this study. Requests for further analysis or comments should be directed to the Industrial Engineering Activity point of contact, Ms. Jane White, AMXIB-IE, commercial (309) 782-7788 or DSN 793-7788.

Encl

for JOHN E. HOLVOET
Director, U.S. Army Industrial
Engineering Activity

AMXIB
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1991 VINTAGE STUDY

Department of the Army Industrial Plant Equipment (IPE)

Prepared By

Jane White

JANE WHITE
Program Analyst

U.S. Army Industrial Engineering Activity
Rock Island Arsenal
Rock Island, IL 61299-7260

Any questions are welcomed at DSN 793-7788 or
commercial (309) 782-7788

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EXECUTIVE SUMMARY

This study is an analysis of the inventory of Army owned Industrial Plant Equipment (IPE). The purpose of the study is to examine the trends and distribution of IPE within various categories, especially age. Unless otherwise noted, the data is obtained from the Army Industrial Equipment Data Base established in compliance with paragraph 5-3c(8), AR 700-90. The data base resides on Amdahl 5880 mainframe at the Rock Island Arsenal and is maintained by the Industrial Engineering Activity (IEA). The Defense Industrial Plant Equipment Center (DIPEC) provides a tape to IEA on a monthly basis to update Army IPE records.

The total quantity of IPE is beginning to take a downward trend. The reasons for reductions are two fold. First, the Army inventory is under stricter guidelines which causes IPE to be either reclassified as OPE, or, because of its condition, to be excessed. Reclassification will cause a great change in reporting next year's equipment. Second, due to greater budgetary constraints, fewer purchases of new equipment are being made.

New policy, pending final approval and publication, has identified the dollar threshold to change from $5,000 to $15,000 for Industrial Plant Equipment and to include only Federal Supply Group 34. This will reduce reporting requirements significantly in that at this writing, there are only 13,699 pieces of FSG 34 equipment that are over $15,000. Notification will be published in the DFARS through the use of an Acquisition Letter and will be incorporated into AR 700-43 through a change notice.

The Army inventory of active and inactive IPE, as of 30 April 1991, includes 40,228 items with an original acquisition cost of $2 billion. The AMC inventory contains 94 percent of all Army IPE from a quantity viewpoint and 98 percent from an acquisition cost viewpoint. The majority of AMC's equipment is active, and AMC owns all the inactive Army IPE.

An indication of equipment usefulness can also be obtained by looking at the condition code of the equipment. This is a two digit code that reflects the condition of the equipment, based on: 1) a machine's ability to perform it's function and 2) the cost of repair. The codes are typically assigned by experts in the rebuild/maintenance field. A summary of validated condition codes for inactive AMC equipment is provided in this study to present a view of equipment condition from a perspective other than age.

SECTION I

OVERVIEW OF ARMY EQUIPMENT

An overview of Army-owned Industrial Plant Equipment (IPE) is presented in this section. It covers inventory trends, historical background, IPE age distribution, condition code, ownership by Command, and equipment type and status.

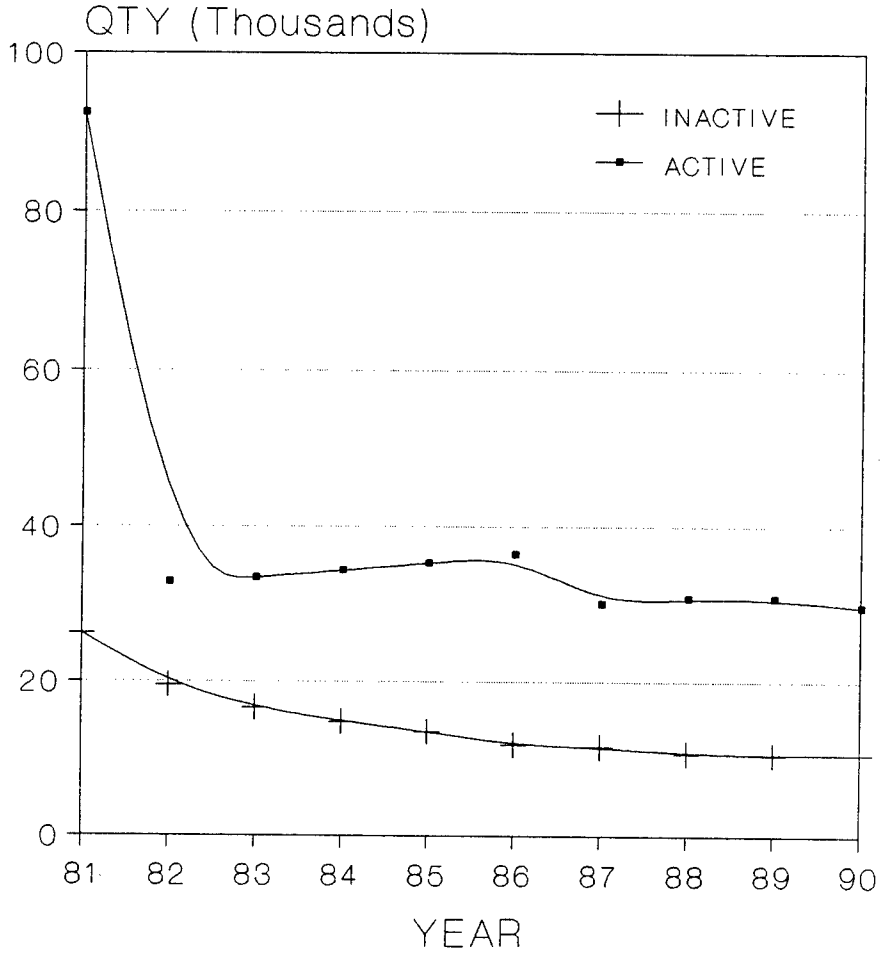
As a result of budget cuts and stricter guidelines, inventory is slightly reduced from last year. As of 30 April 1991, the Army inventory of IPE consisted of 40,228 items with an acquisition cost of $2 billion and an estimated replacement cost of $6.3 billion.

AMC manages 94 percent of the Army IPE, or 37,869 items. The percentages of active and inactive AMC equipment are 72.0 and 28.0 percent respectively. AMC is the only Army organization possessing Plant Equipment Packages (PEPs). PEPs are defined as Government-owned active and/or inactive industrial plant equipment which has been approved by a military department or Defense Agency for retention to support surge/mobilization production requirements. Therefore, AMC manages all Army "laidaway" IPE.

The inactive or "laidaway" IPE managed by AMC has an older age profile than the active equipment. Age, however, is not necessarily the best or exclusive trait for determining utility or fitness of equipment. Another indication of AMC equipment usefulness can be obtained by looking at the condition code of equipment. This is a two digit code that reflects the condition of the equipment, based on: 1) a machine's ability to perform its function and 2) the cost of repair. A table of condition codes used in this study are provided in Appendix A.

Verification of the codes assigned to inactive IPE was initiated in 1985 to insure conformance with the Defense Industrial Reserve Act of 1973 (PL 93-155). This Act established the requirement that PEPs be maintained in a high state of readiness. A DOD Inspector General Audit in 1984 revealed that PEPs were not in immediate use condition, thereby violating the 1973 Defense Industrial Reserve Act. As a result of the audit, condition assessments of inactive equipment were initiated in 1985 on a comprehensive basis. A condition assessment typically involves a team of experts in the rebuild field, traveling to the equipment site to inspect each individual piece of equipment and to verify or assign a new condition code to indicate the actual physical state. A chart on the condition codes assigned to the inactive inventory is provided on page 8. A condition code change is only required by DIPEC when a new piece of equipment is purchased, an item changes active/inactive status, an item is moved to a new location, or an item is being excessed. This procedure is accomplished using a DD Form 1342, DOD Property Record.

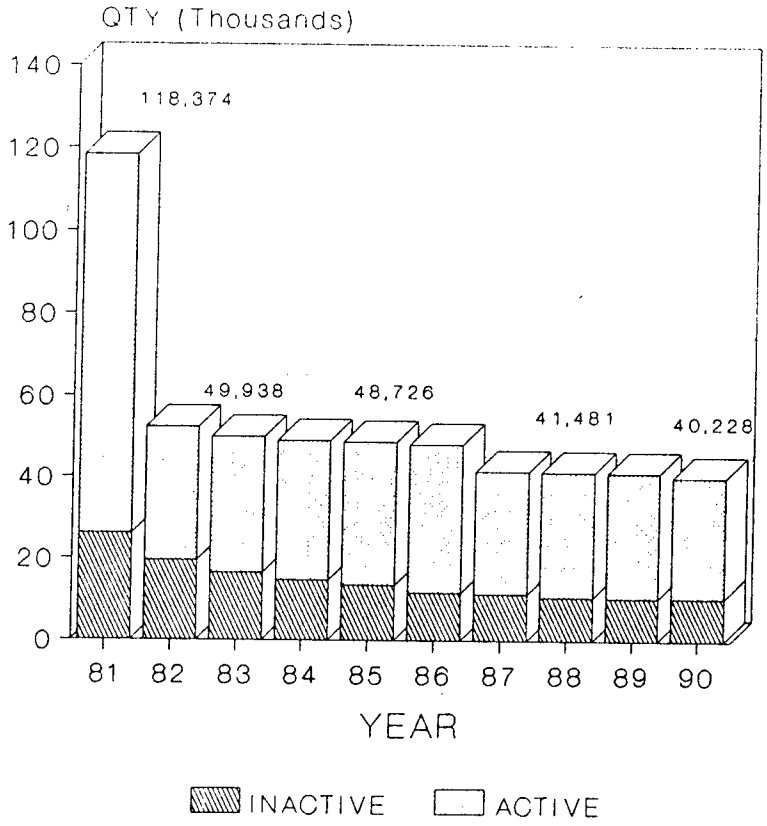
INVENTORY TRENDS FOR DEPARTMENT OF THE ARMY IPE



AS OF 30 APR 1991
SOURCE: DA CENTRAL INVENTORY OF IPE

This trend chart reflects the general inventory pattern of IPE over the last 10 years. Because of anticipated changes in the definition of IPE, the trend should change significantly next year. During 1990, however, there was only a slight reduction. In addition, budget cuts will continue to constrain purchases of new equipment. Efforts to eliminate non-essential Plant Equipment Packages (PEPs) are on-going as Operational Maintenance Army (OMA) funds are cut and the ability to maintain laidaway equipment and buildings is diminished.

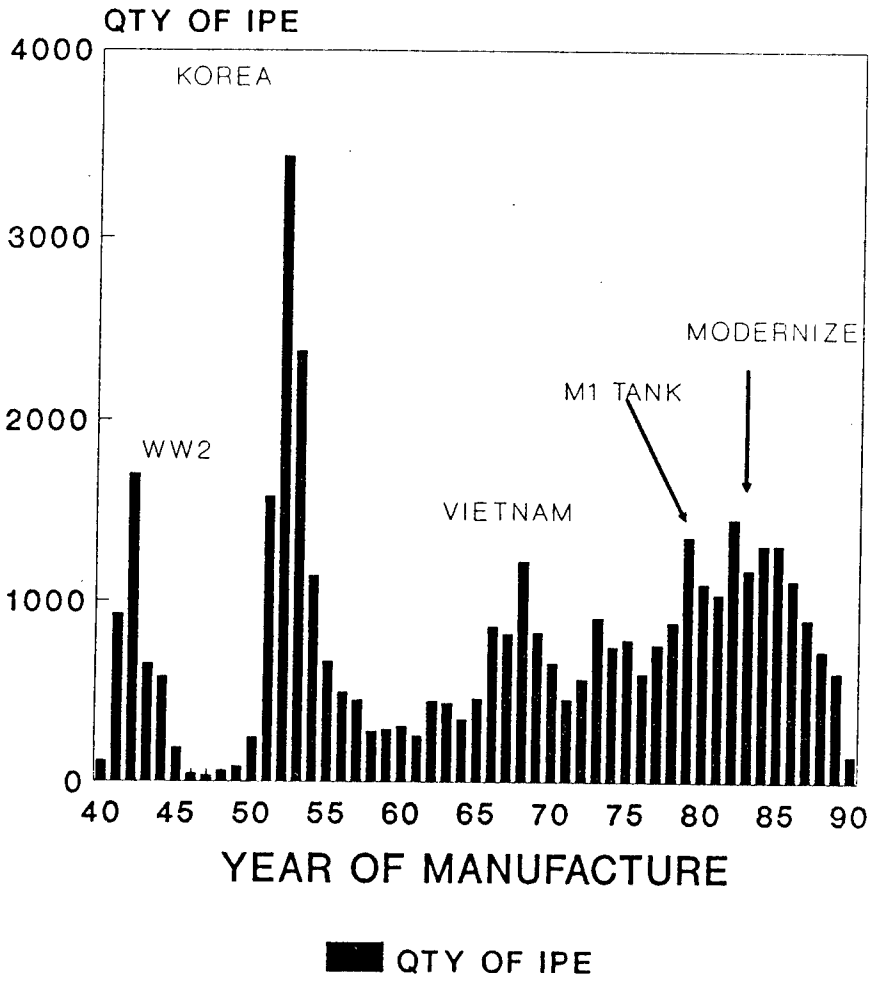
DEPARTMENT OF THE ARMY
INVENTORY OF IPE



AS OF 30 APR 1991
SOURCE: DA CENTRAL INVENTORY OF IPE

The figure above shows, by year, the total quantity of Army IPE. The drastic decline shown in 1982 can be attributed to the decontrol of numerous items of IPE. In 1982, the definition of Industrial Plant Equipment (IPE) changed from having an acquisition cost threshold of $1,000 to a threshold of $5,000 for contractors and $3,000 for in-house activities. Next year (1992), the cost threshold is expected to change from $5,000 to $15,000. Equipment in these acquisition cost ranges was reclassified as Other Plant Equipment (OPE). In addition, 19 Federal Supply Classes were deleted from inclusion as IPE in 1982. The minor decline in 1987 transpired when the IPE threshold for in-house activities was again raised, this time from $3,000 to $5,000 in an effort to standardize management levels. Another contributing factor to the 1987 decline was the elimination of our large Plant Equipment Packages (PEPs) containing equipment for the M60 tank. As was mentioned in the Executive Summary, IPE is being redefined once again. New policy, pending final approval and publication, has identified the dollar threshold to change from $5,000 to $15,000 for Industrial Plant Equipment and to include only Federal Supply Group 34 items. This would significantly change next year's inventory.

AGE DISTRIBUTION OF INDUSTRIAL PLANT EQUIPMENT

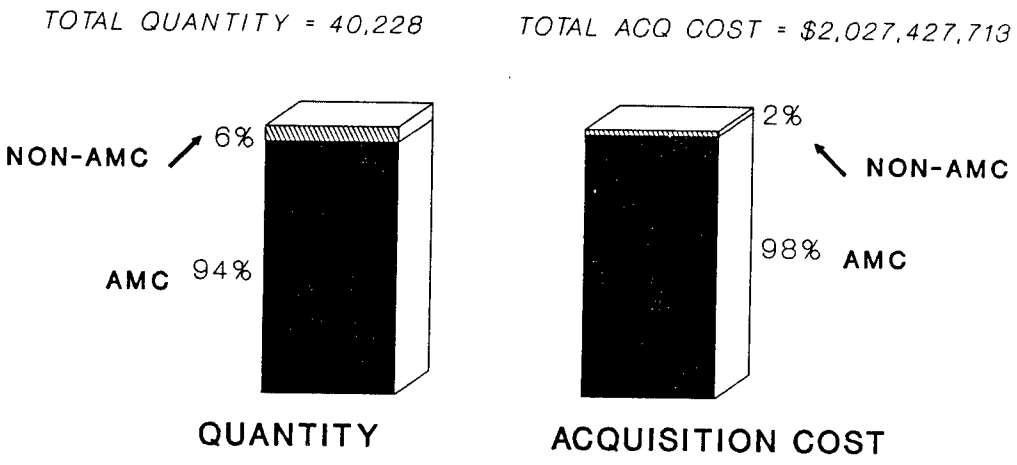


AS OF 30 APRIL 1991

This graph shows the year of manufacture for metalworking equipment in the Army inventory manufactured after 1940. There is equipment in the inventory built prior to 1940 but it accounts for one-half of one percent of the inventory and has not been included in this graph. Spikes in the graph prior to 1970 indicate tooling purchases as the Army geared up to supply war efforts. Notice that the spikes tend to occur 2 to 3 years into the war due to the lead time to purchase IPE and the competing material needs of the industrial base. The gradual increasing trend from 1975 to the early eighties were a reflection of the following: Army invested in REARM programs to modernize the Government arsenals at Rock Island, IL and Waterliet, NY; new machine tools had to be purchased which were capable of producing to the close tolerances required by new weapons systems such as the M1 tank; and the establishment of the Mississippi Army Ammunition Plant.

In 1986, the quantities of machine tools purchased appears to drop off drastically. The figures on equipment quantities purchased from 1989 to the present can be misleading due to two factors. First, there is a lead time involved in the purchase of equipment. A machine purchased in 1989 may not be received from the manufacture until 1990. Secondly, time is required for the property administrator to process the DD Form 1342. This is the form which is sent to the Defense Industrial Plant Equipment Center (DIPEC) to indicate the addition of the machine to the Army production base. Upon receipt of the form at DIPEC, the form is reviewed for accuracy and the data is entered into the IPE data base. If the DD Form 1342 is incorrect when it reaches DIPEC, time is required for DIPEC to establish the correct information. Notable delays have occurred in the past, postponing entry into the data base by more than a year. Therefore, inventory figures for recent years (1989 to 1990) should be viewed with these delays in mind. The inventory figures have gone down for years prior to 1970. Approximately, 264 pieces of equipment have been excessed or turned in since last year's Vintage Study. For the years 1970 to 1991, the inventory has gained 43 pieces of equipment.

INDUSTRIAL PLANT EQUIPMENT OWNERSHIP

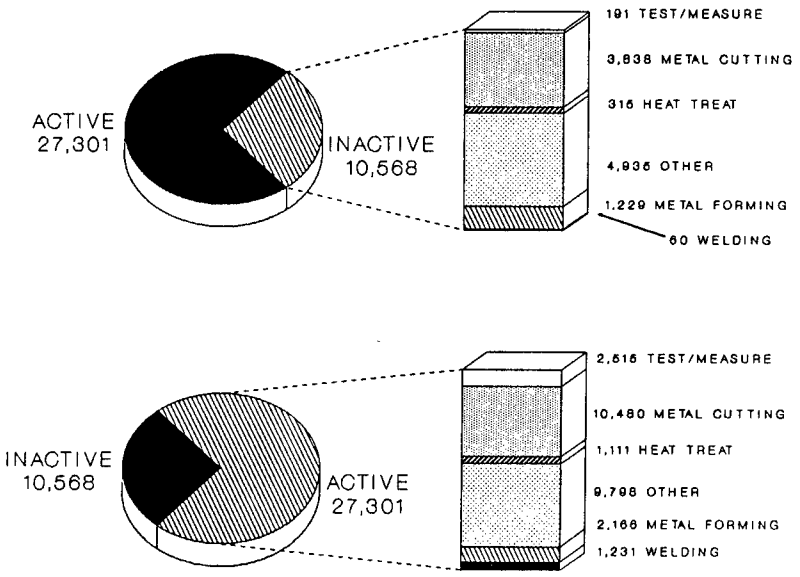


AS OF 30 APR 1991

The Department of the Army inventory of Industrial Plant Equipment (IPE) consists of 40,228 items with a combined acquisition cost of $2 billion and an approximated combined replacement value of $6.3 billion. The average acquisition cost for April 1991 inventory of IPE is $39,700, with acquisition values ranging from $5,000 to $6,749,185. The Army Materiel Command (AMC) owns 94 percent of all IPE from a quantity viewpoint, the same percent as last year, however overall quantities are down 1 percent. AMC owns 93 percent from an acquisition cost view point, down 5 percentage points from last year. Clearly, AMC is the major use of IPE within the Army, and it is reasonable to consider AMC as being representative of the Army.

AMC EQUIPMENT

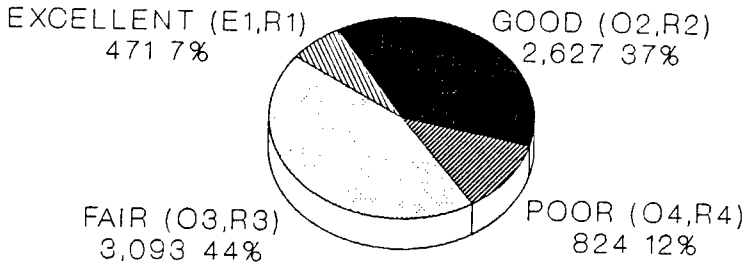
ACTIVE VS. INACTIVE



The majority of the 37,869 pieces of Industrial Plant Equipment (IPE) owned by AMC are active, or 72.0 percent. AMC is the only Army organization possessing Plant Equipment Packages (PEPs). Therefore, AMC owns all laid away Army IPE.

The "other" equipment category shown above, is composed of a variety of miscellaneous equipment including; metal finishing tanks, barrel finishing machines, plastic injection molding machines, chemical pelletizers, bonding machines, trimming machines, fusing machines, dipping machines, and marking machines in addition to many other ammunition peculiar equipment.

INACTIVE EQUIPMENT CONDITION
BASED ON CONDITION ASSESSMENTS

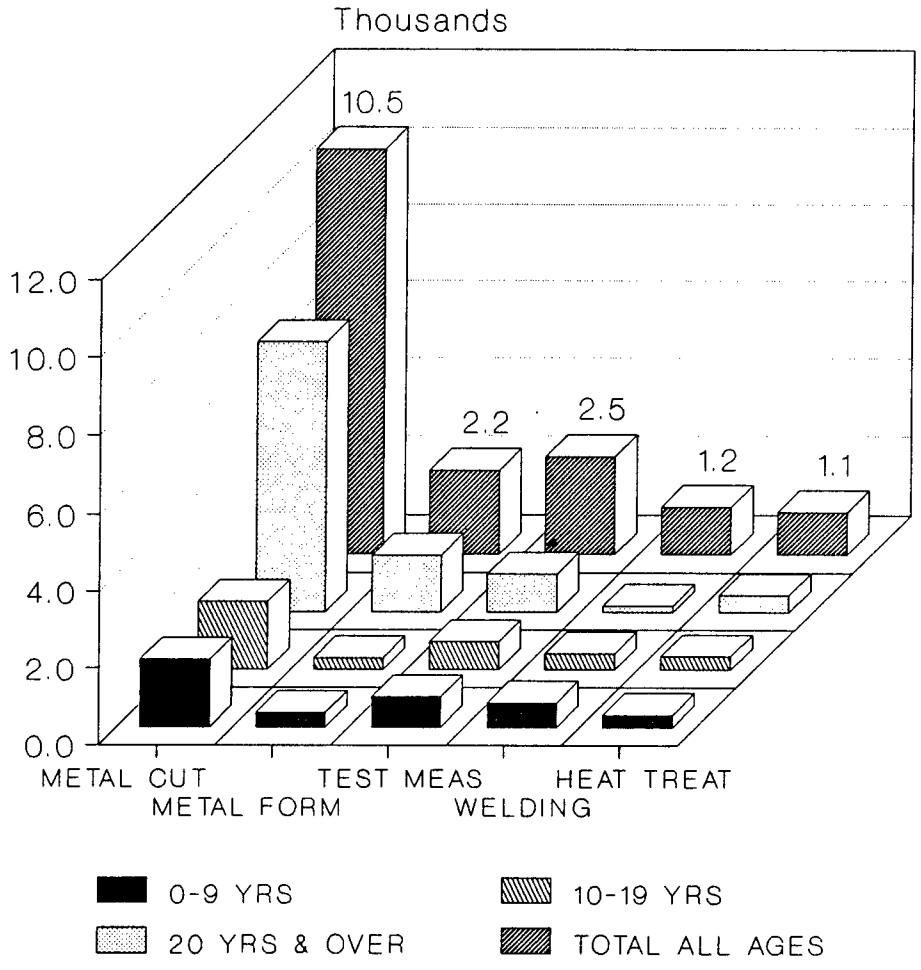


AS OF 30 APRIL 1991

AR 700-90 directs all equipment to be in 02 condition or better prior to layaway. However, the common practice at the end of a production run is to select the oldest and least dependable IPE items for layaway. In the case of inactive equipment, physical degradation abates at the time of layaway when a layaway is properly performed. Yet it is obvious from the graph above that percent of the equipment in layaway is currently in less than 02 condition. This is a good indication that equipment placed in layaway is not conforming to the regulations.

Condition assessments were completed for all IPE at central storage sites in 1988 and are ongoing at planned producer sites. Requests are increasing due to the fact that more equipment is being scheduled for layaway or disposal. There have been 7,471 items of existing inactive IPE condition assessed as of 30 April 1991.

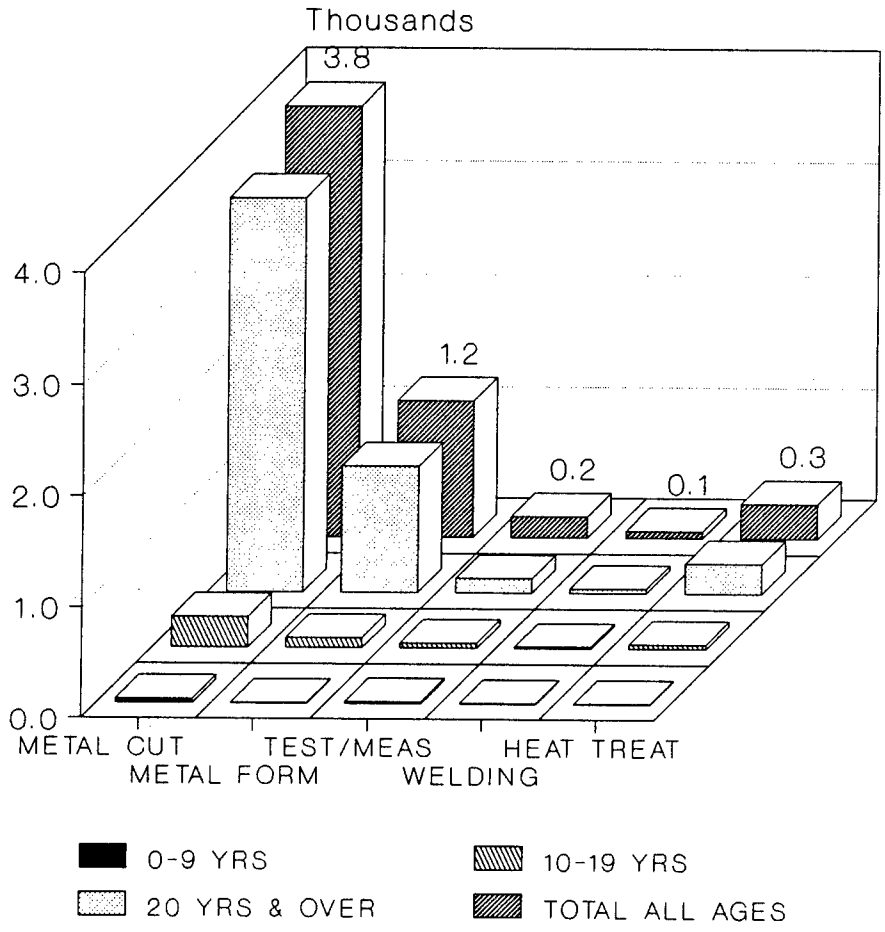
AMC ACTIVE EQUIPMENT
AGE



AS OF 30 APR 1991

This figure divides active Industrial Plant Equipment (IPE) into five major classes of IPE including metalcutting, metal forming, mechanical test and measuring, welding, and heat treat/furnaces. In the AMC active inventory, the metalcutting category is unmistakably the largest.

AMC INACTIVE EQUIPMENT
AGE



AS OF 30 APR 1991

This figure divides inactive Industrial Plant Equipment (IPE) into the same five classes as the previous figure. Note that inactive equipment has an older age profile than does the active equipment. Also note that metalcutting equipment has the oldest age profile shown for both active and inactive equipment while welding has the youngest. This can be attributed to the shorter useful life of welding equipment and longer useful life of metalcutting equipment.

SECTION II

AMC/INDUSTRY COMPARISON

An age comparison of AMC and private industry equipment is shown in this chapter for IPE classes of metalcutting, metalforming, and welding/joining. Mechanical test and measuring equipment and heat treat equipment are excluded from this section due to the unavailability of historical data. The Federal Supply Classes (FSCs) for each type of equipment included in this chapter are listed in Appendix B. All data in this section is presented as a percentage of the total quantity of equipment for a specific class.

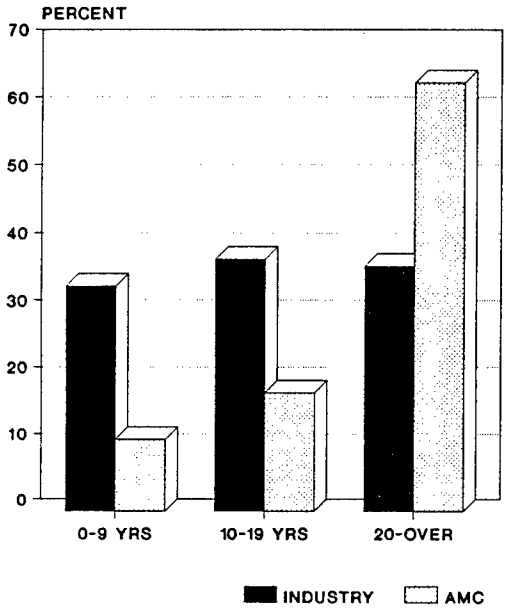
Private industry data was obtained from the 12th, 13th, and 14th Inventories of Metalcutting Equipment, published in 1978, 1983, and 1989, respectively, by the American Machinist Magazine, a McGraw-Hill publication. The data is normally represented in 5 year increments; however, the 14th Inventory was delayed 1 year and published in November 1989. According to this last Inventory, published in 1989, the average age of manufacturing equipment in private industry has gone down for the last two inventories. In 1945, following the emergency tooling for war production, 62 percent of metalcutting machines were less than 10 years old. This percentage had declined steadily since then, except for a rise of one percent following the first enactment of the investment tax credit in 1962. The investment tax credit, a special stipulation in the U.S. Internal Revenue Laws, allowed businesses to deduct a certain percentage of the dollar cost of new investment as a credit against income taxes. This encouraged corporate investment.

Aside from this one percent rise, the first indication of a reversal of this trend toward aging equipment was in the 13th American Machinist Inventory in November of 1983. With the 14th American Machinist Inventory, it appears the trend toward a younger average equipment age in private industry is continuing.

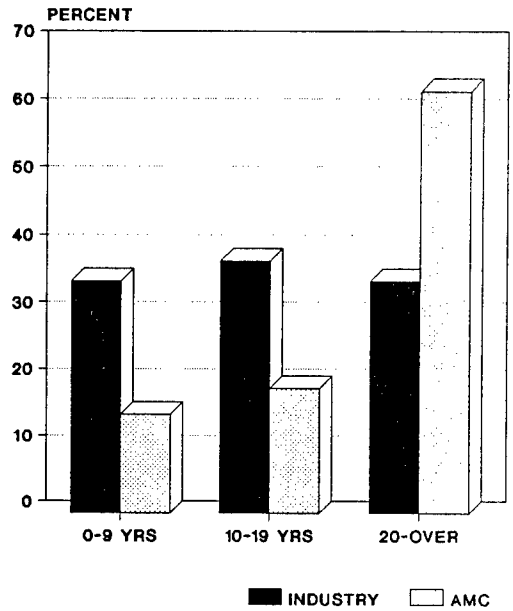
Government equipment does not follow the same trend. Both metalcutting and metalforming equipment have an increased average age compared to the 1984 Vintage Study data. Welding equipment is the only category in this study with a lower average age in comparison to the 1984 study.

In this section of the Vintage Study, the chart formats reflect historical data to assist in the visualization of trends. Since the American Machinist Inventory is published at 5 year intervals, the last three inventories are portrayed in this study to provide a comparison of the data side-by-side.

METALCUTTING EQUIP AGE COMPARISON AMC VS. INDUSTRY

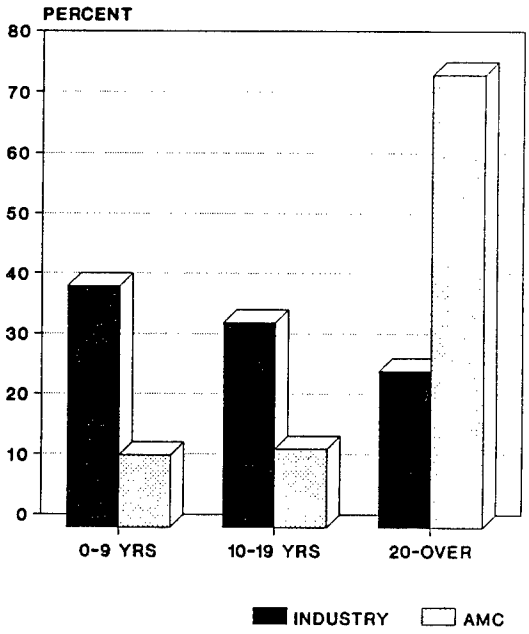


1978



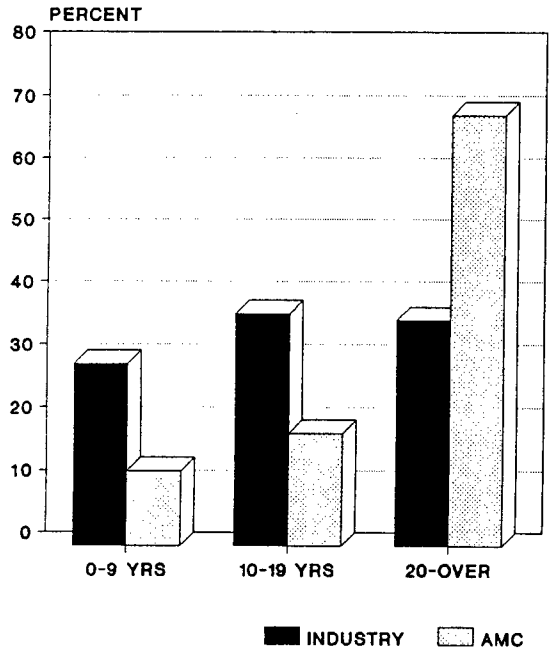
1983

The AMC metalcutting equipment age profile reflects a replacement level that has not kept pace with the ageing of the inventory. On the other hand, private industry exhibited a relatively consistent investment in replacement of metalcutting equipment between 1978 and 1983; and in 1989, investment was significant enough to substantially improve industry's age profile. This distribution reflects negatively in terms of AMC keeping pace with industries' investments in metalcutting machine tools.

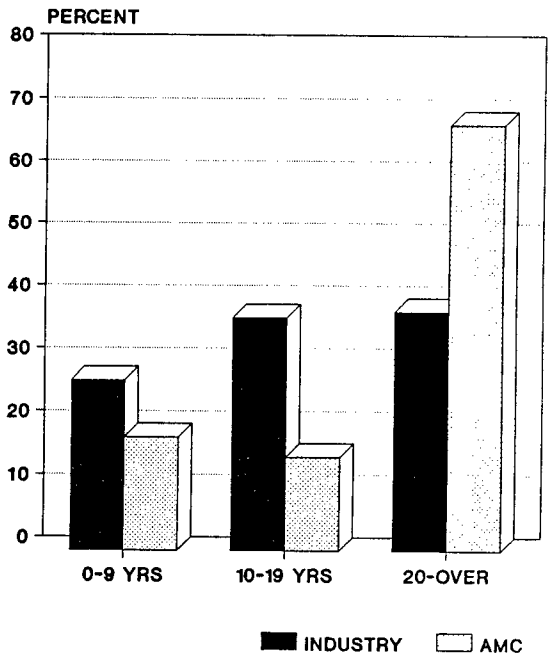


1989

METALFORMING EQUIP AGE COMPARISON AMC VS. INDUSTRY

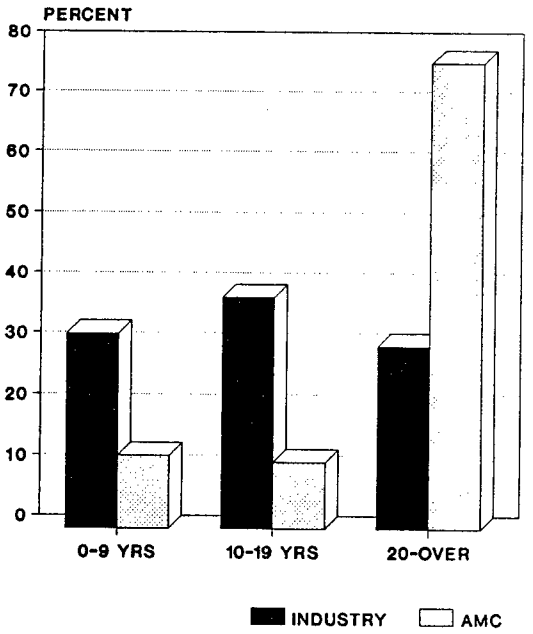


1978



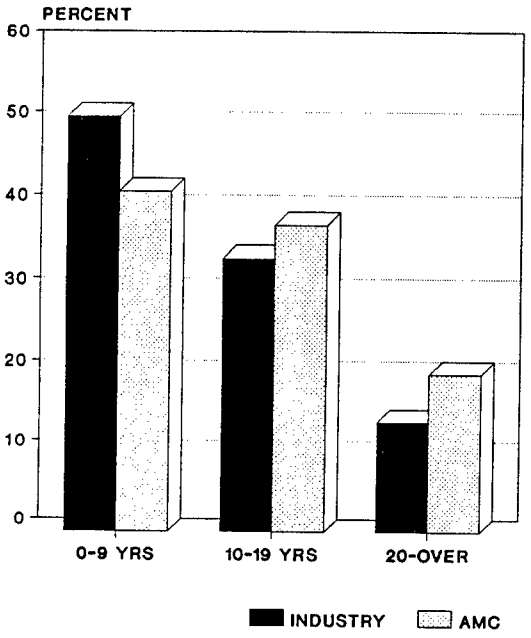
1983

The age profile of AMC metalforming equipment is similar to that of metalcutting equipment, in that replacement has not kept pace with the ageing of the inventory. Here again, private industry has a more favorable age profile by consistent investment in equipment. One reason for the large amount of AMC equipment over 20 years old, is that some Plant Equipment Package (PEP) equipment has been laidaway as long as 33 years.



1989

WELDING EQUIPMENT AGE COMPARISON
AMC VS. INDUSTRY



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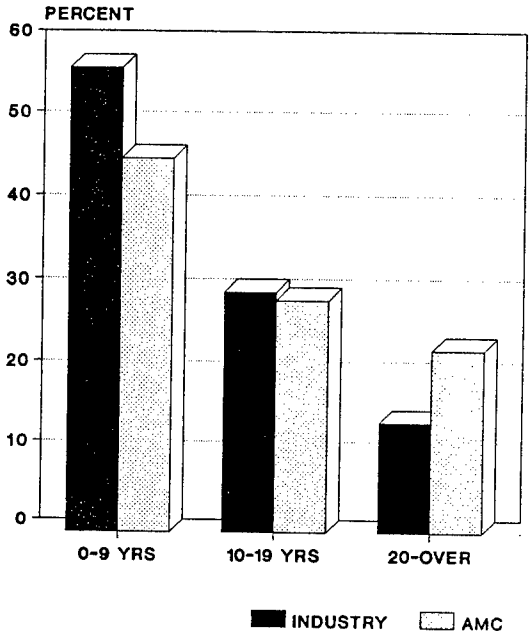
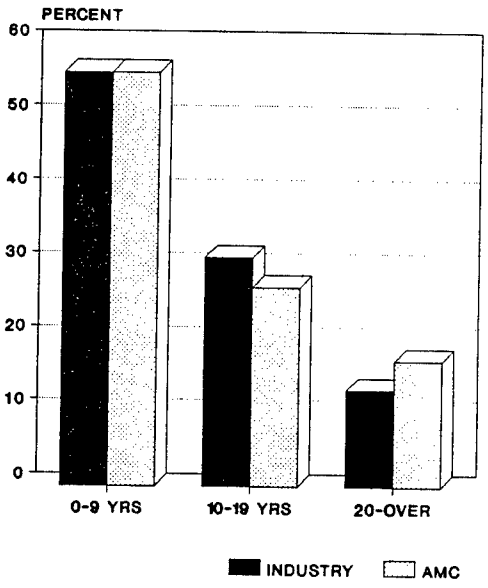


1983

Private industry and AMC exhibit similar status for this type of IPE. This effect seems to originate from the shorter useful life inherent in this type of equipment. In the latest inventory, AMC has caught up with industry.



1989

SECTION III

EQUIPMENT STATUS WITHIN AMC

This section presents the age distribution for five types of Industrial Plant Equipment (IPE) for each of the AMC Major Subordinate Commands (MSCs). The age distribution is portrayed for three age categories, 0-9 years, 10-19 years, and 20 and over for each type of equipment including metalcutting, metal forming, mechanical test and measure, welding, and heat treat/furnaces. These age distributions are presented for both active and inactive equipment. The various equipment types are gathered by Federal Supply Class (FSC) which can be found in Appendix B.

In the following graphs you will note that, with only one exception, AMCCOM manages the preponderance of each class of Army owned equipment. AMCCOM is the single item manager for conventional ammunition for the entire Department of Defense. The Government owns the majority of equipment at AMCCOM managed facilities, because of the unique nature of military ammunition relative to items such as transmissions or aircraft parts.

AMCCOM and AVSCOM have the only PEP equipment; therefore, these are the only two commands you will see managing inactive equipment on the following charts.

Almost all of the categories of equipment have reduced in varying amounts from last year. Some of the reasons for this are:

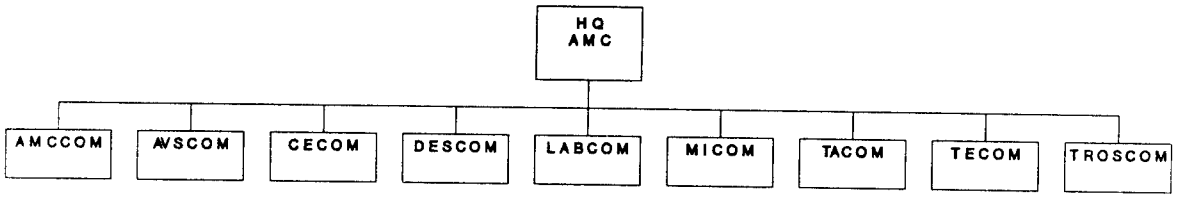
1. Equipment is no longer capable of producing the required amount of items to meet mobilization requirements.

2. The manufacturing technologies have changed so dramatically that the equipment is outdated.

3. In some cases, one piece of new equipment replaces many pieces of old equipment that performs the same function and quantity.

These are some of the major reasons for equipment reduction in inventories. At the end of each paragraph describing each chart, a percentage is given which shows either an increase or reduction from last year's total.

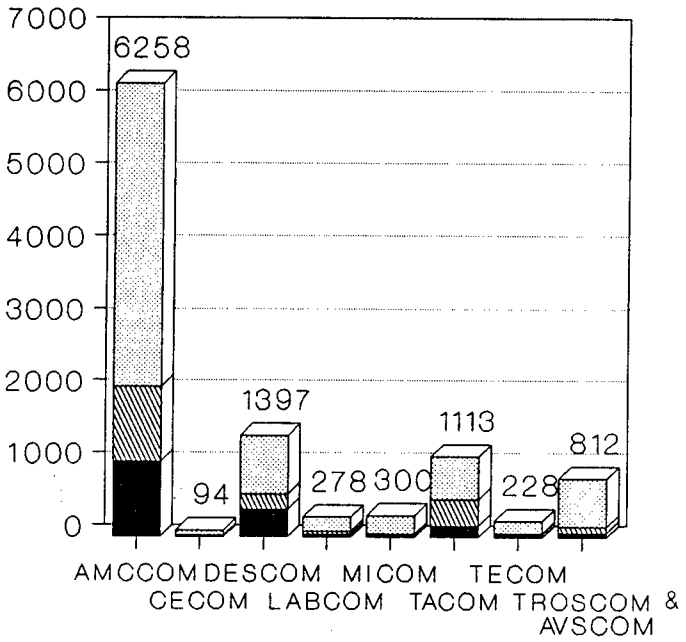
HQ AMC
ORGANIZATIONAL CHART



There are nine MSCs under HQ AMC. Definitions for each command acronym are as follows: AMCCOM - Armament Munitions and Chemical Command, AVSCOM -Aviation Systems Command, CECOM - Communications-Electronics Command, DESCOM - Depot Systems Command, LABCOM - Laboratory Command, MICOM - Missile Command, TACOM - Tank and Automotive Command, TECOM - Test and Evaluation Command, and TROSCOM - Troop Support Command.

The Base Realignment and Closure (BRAC) Commission is in the process of implementing changes in the FY 1992-1997 timeframe. The changes include relocation of the armament and chemical missions of HQ AMCCOM at Rock Island to Redstone Arsenal, Alabama to create the Missile, Armaments, and Chemical Command (MACCOM). Another change includes combining AVSCOM and TROSCOM to form a single command at St. Louis, Missouri. In addition, other significant realignments are being made which will change the entire structure of HQ AMC.

MAJOR SUBORDINATE COMMANDS
ACTIVE METALCUTTING EQUIPMENT

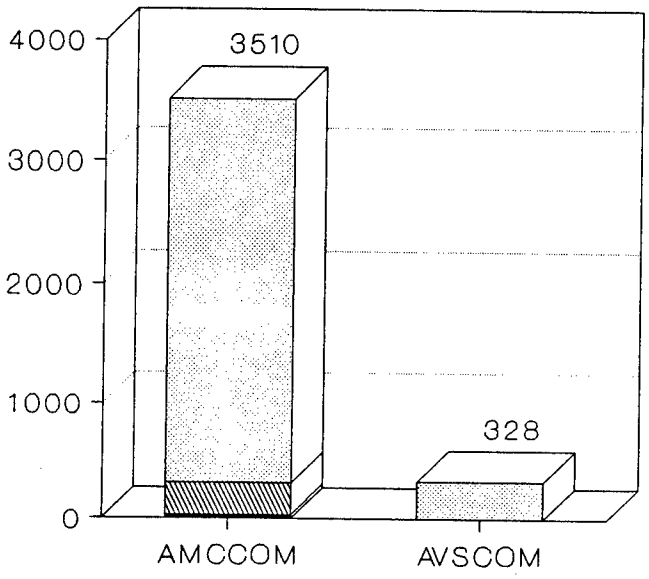


	AMCCOM	DESCOM	CECOM	LABCOM	MICOM	TACOM	TECOM	TROSCOM & AVSCOM
20 YRS & OVER	4184	76	808	194	254	590	169	661
10-19 YRS	1043	15	206	41	13	360	12	85
0-9 YRS	1031	3	383	43	33	163	47	66

AS OF 30 APR 1991

This graph portrays the quantity of active machine tools in the Federal Supply Classes for metalcutting equipment (see Appendix A) for each command. The quantity of equipment has decreased in the last five years, an average of 15 percent for each command. AMCCOM manages the majority of active metalcutting equipment at 60 percent. DESCOM is a distant second managing 13 percent of the inventory. In the past year, metalcutting equipment was reduced 9 percent.

MAJOR SUBORDINATE COMMANDS
INACTIVE METALCUTTING EQUIPMENT



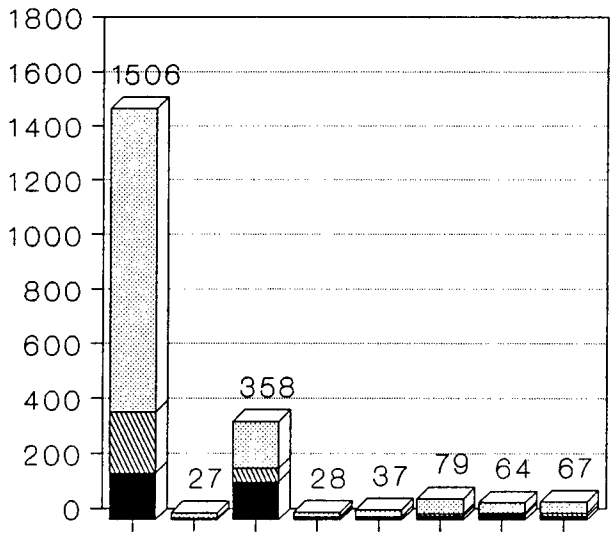
	AMCCOM	AVSCOM
20 YRS & OVER	3199	328
10-19 YRS	275	0
0-9 YRS	36	0

0-9 YRS 10-19 YRS 20 YRS & OVER

AS OF 30 APR 1991

Only two of the Major Subordinate Commands have inactive metalcutting equipment. AMCCOM has the bulk of the equipment with 91 percent of the inventory, 91 percent of that is 20 years of age or older. All of AVSCOM's inactive metalcutting equipment falls into the 20 years and over category. An overall reduction of 11 percent occurred during the last year.

MAJOR SUBORDINATE COMMANDS
ACTIVE METALFORMING EQUIPMENT



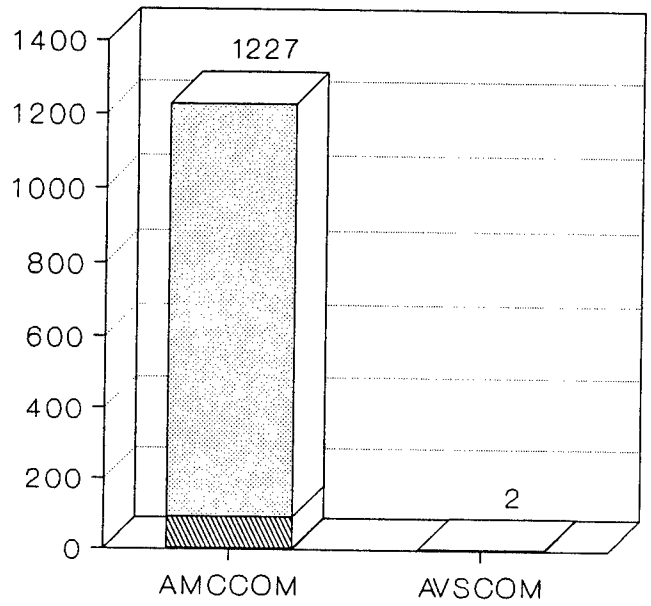
	AMCCOM	DESCOM	CECOM	LABCOM	MICOM	TACOM	TECOM	TROSCOM & AVSCOM
20 YRS & OVER	1113	22	169	16	24	56	37	41
10-19 YRS	221	5	49	5	1	9	7	12
0-9 YRS	172	0	140	7	12	14	20	14

0-9 YRS 10-19 YRS 20 YRS & OVER

AS OF 30 APR 1991

This graph shows, by command, the active metalforming equipment. AMCCOM manages 69 percent of the active metalforming equipment in the AMC inventory, and 74 percent of the AMCCOM inventory is 20 years of age or older. DESCOM manages 17 percent, with CECOM, LABCOM, MICOM, TACOM, TECOM, TROSCOM, and AVSCOM managing the remaining 14 percent of the inventory. A total reduction of 8 percent occurred during the past year.

MAJOR SUBORDINATE COMMANDS
INACTIVE METALFORMING EQUIPMENT



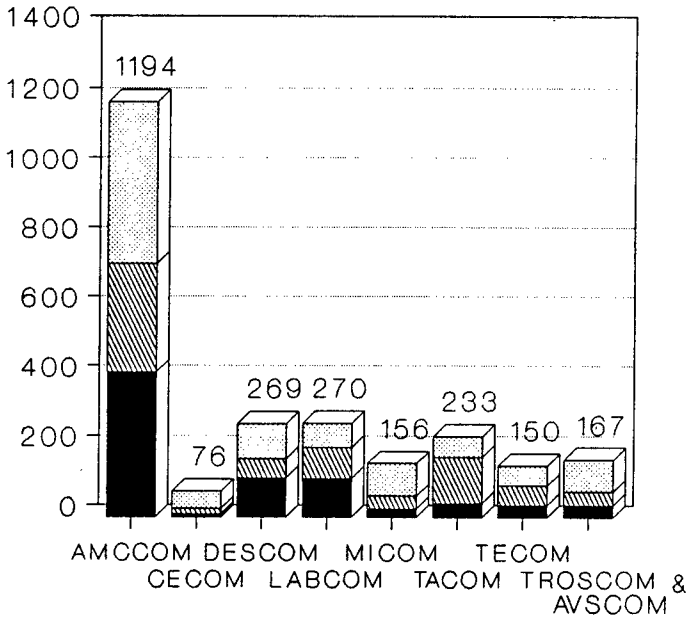
	AMCCOM	AVSCOM
20 YRS & OVER	1134	2
10-19 YRS	90	0
0-9 YRS	3	0

0-9 YRS 10-19 YRS 20 YRS & OVER

AS OF 30 APR 1991

Again, only two of the Major Subordinate Commands have inactive metalforming equipment. Nearly 100 percent of the equipment is controlled by AMCCOM and 92 percent of it is over 20 years of age. This is very similar to the age profile of inactive metalcutting equipment shown earlier. A small increase of 3 percent occurred over the last year.

MAJOR SUBORDINATE COMMANDS
ACTIVE MECH TEST & MEAS EQUIPMENT



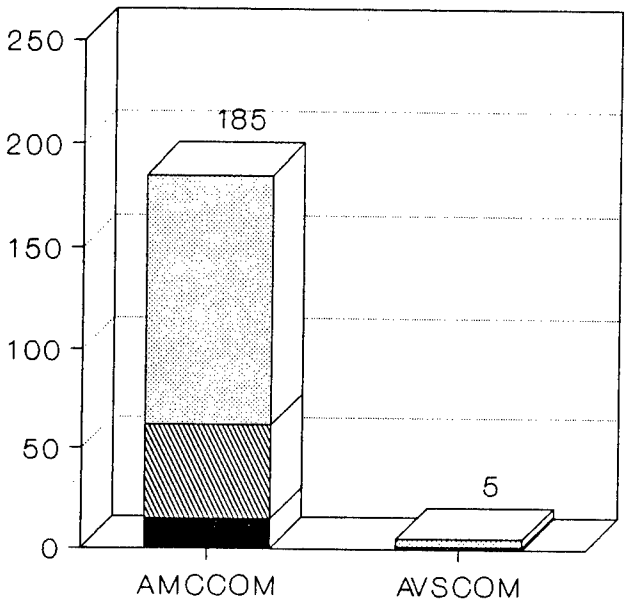
	AMCCOM	CECOM	DESCOM	LABCOM	MICOM	TACOM	TECOM	TROSCOM & AVSCOM
20 YRS & OVER	464	51	99	69	94	58	58	92
10-19 YRS	314	15	55	88	36	134	55	39
0-9 YRS	416	10	115	113	26	41	37	36

0-9 YRS 10-19 YRS 20 YRS & OVER

AS OF 30 APR 1991

The equipment in this graph displays a significantly younger age profile than active metalcutting and metalforming equipment. Thirty-two percent of the active mechanical test and measuring equipment falls into the 0-9 years of age category, and 39 percent are past their prime at 20 years of age or older. This can be attributed to a shorter life span for test and measuring equipment, necessitating more frequent replacement. Over the past year, however, a minor reduction of 1 percent of all mechanical test had measuring equipment occurred.

MAJOR SUBORDINATE COMMANDS
INACTIVE MECH TEST & MEAS EQUIP



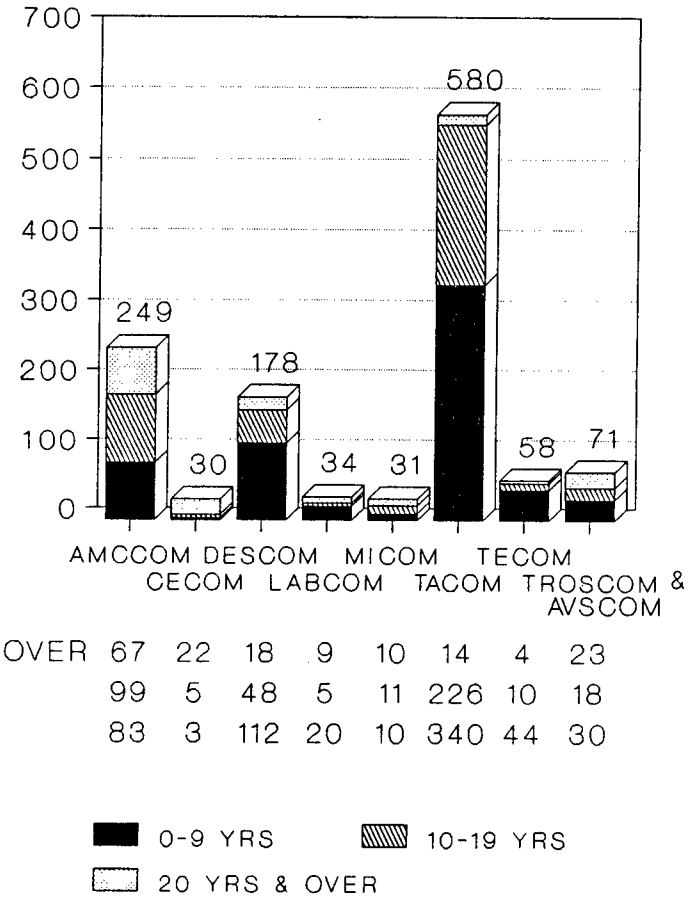
	AMCCOM	AVSCOM
20 YRS & OVER	123	4
10-19 YRS	47	1
0-9 YRS	15	0

0-9 YRS 10-19 YRS
20 YRS & OVER

AS OF 30 APR 1991

As with other types of equipment shown thus far, AMCCOM manages the vast majority of inactive mechanical test and measuring equipment, more precisely 97 percent. As stated with the active equipment, a minor reduction of 1 percent was noted from last year's total.

MAJOR SUBORDINATE COMMANDS
ACTIVE WELDING EQUIPMENT

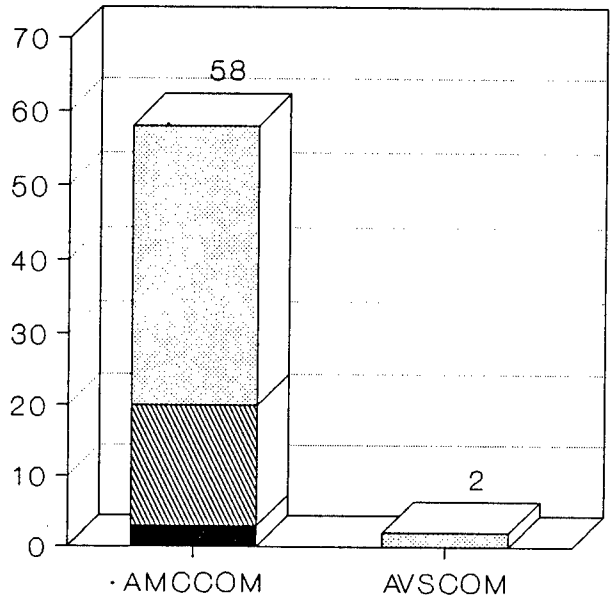


	AMCCOM	CECOM	DESCOM	LABCOM	MICOM	TACOM	TECOM	TROSCOM & AVSCOM
20 YRS & OVER	67	22	18	9	10	14	4	23
10-19 YRS	99	5	48	5	11	226	10	18
0-9 YRS	83	3	112	20	10	340	44	30

AS OF 30 APR 1991

Management of active welding equipment is dominated by TACOM, which has 47 percent of the inventory. This can be attributed to the fact that the items for which TACOM is responsible generally required more welding than items managed by other commands. Also notable in this graph is the younger age profile of welding equipment in comparison to all other types of IPE in this study. Fifty-two percent of the active welding equipment is relatively young, under 10 years old. As with test and measuring equipment, this can be attributed to the shorter life span of welding equipment and the need for more frequent replacement. During the past year, active welding equipment has been reduced by 2 percent.

MAJOR SUBORDINATE COMMANDS
INACTIVE WELDING EQUIPMENT

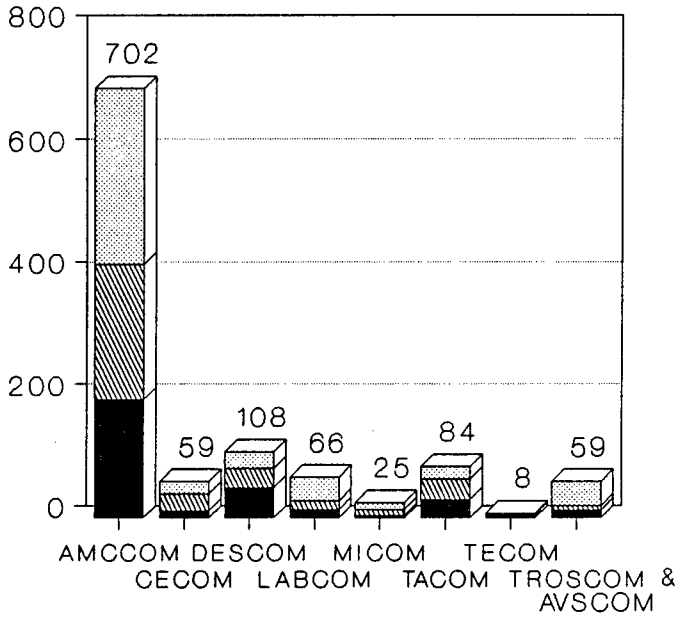


	AMCCOM	AVSCOM
20 YRS & OVER	38	2
10-19 YRS	17	0
0-9 YRS	3	0

AS OF 30 APR 1991

Inactive welding equipment has a younger age profile than all other inactive equipment. Again, this is accounted for by the shorter life span of welding equipment. Unlike the active welding equipment, where TACOM manages the bulk of the inventory, AMCCOM retains nearly 100 percent of the inactive welding inventory. This has been true since 1987, when the tank PEPs managed by TACOM were eliminated. Inactive welding equipment was reduced from last year's total by 13 percent.

MAJOR SUBORDINATE COMMANDS
ACTIVE HEAT TREAT EQUIPMENT



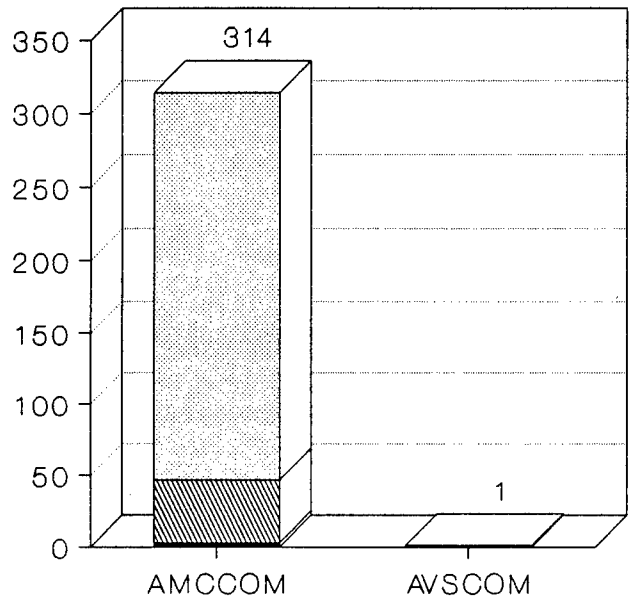
	AMCCOM	DESCOM	CECOM	LABCOM	MICOM	TECOM	TACOM	TROSCOM & AVSCOM
20 YRS & OVER	286	20	27	38	11	21	1	39
10-19 YRS	222	27	32	14	10	33	1	7
0-9 YRS	194	12	49	14	4	30	6	13

0-9 YRS 10-19 YRS 20 YRS & OVER

AS OF 30 APR 1991

AMCCOM is responsible for 63 percent of the active heat treat machine inventory. Throughout this section, AMCCOM has been seen to manage the majority of AMC equipment. This is due to the fact that AMCCOM manages five Gorvernment-Owned-Contractor-Operated (GOCO) ammunition plants. Nearly all of the associated plant equipment is owned by the Army rather than a contractor. During the past year, active heat treat equipment was reduced by 4 percent.

MAJOR SUBORDINATE COMMANDS
INACTIVE HEAT TREAT EQUIPMENT



	AMCCOM	AVSCOM
20 YRS & OVER	267	1
10-19 YRS	44	0
0-9 YRS	3	0

0-9 YRS 10-19 YRS
20 YRS & OVER

AS OF 30 APR 1991

The above graph shows 85 percent of the inactive heat treat equipment is 20 years of age or older -- most was manufactured before 1970. Thirteen percent of the inactive heat treat equipment was excessed during the last year.

SECTION IV

NUMERICAL CONTROL (NC)

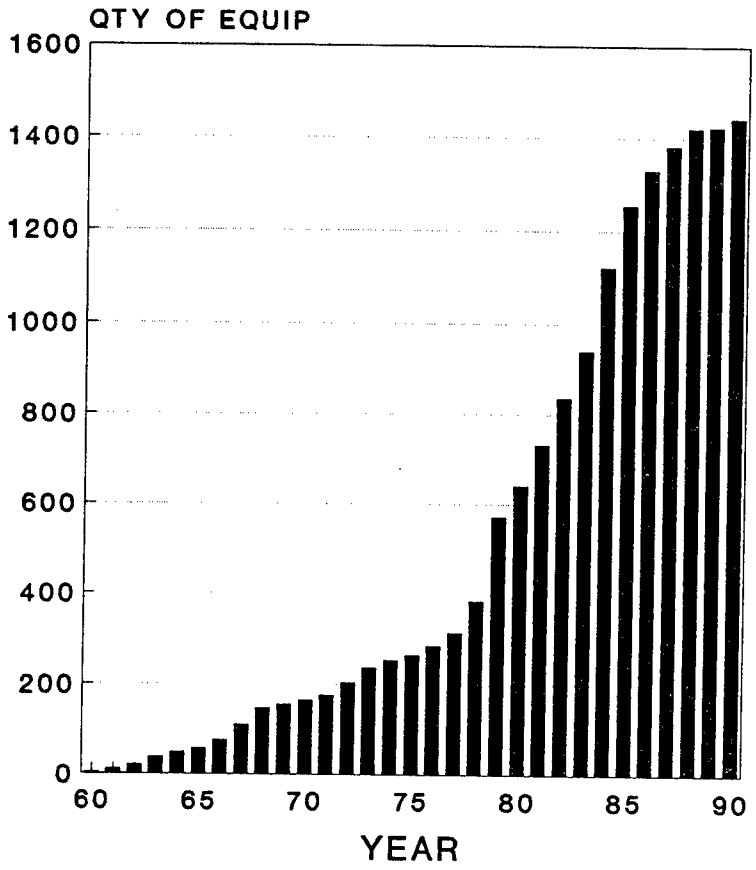
The numerically controlled equipment owned by the Army has been divided into seven major classes as shown on the chart below. These classes are lathes, grinders, bores, drills, mills, mechanical test and measuring machines, and machining centers. All other equipment that falls into classes with less than twenty items of NC equipment has been classified below under the category called "other". The other category also includes ammunition peculiar equipment and one of a kind special purpose NC machines.

The chart below also breaks each class into two categories: active and inactive equipment. Inactive equipment accounts for 7.8 percent of the total number of NC machines, a relatively small percentage compared to 26 percent inactive non-NC metalworking equipment. This can be attributed to the fact that organizations wish to take advantage of the improved operating characteristics of NC machines. Also, the NC machines in the inventory are younger on average than the non-NC machines. The average age for NC machines is 10 years while the average age for non-NC machines is 26 years. This is expected due to the fact that NC machines were not introduced into the manufacturing environment to any significant degree until the 1970's.

EQUIPMENT TYPE	TOTAL	ACTIVE	INACTIVE
BORES	233	216	17
DRILLS	23	17	6
GRINDERS	53	50	3
LATHES	565	518	47
MACH CTRS	253	230	23
TEST/MEAS	34	31	1
MILLS	163	153	10
OTHER	153	153	0
TOTAL	1485	1368	117

The numerical control inventory of AMC consists of 1,485 items of IPE with an original acquisition cost of $366 million and a replacement value of $626 million.

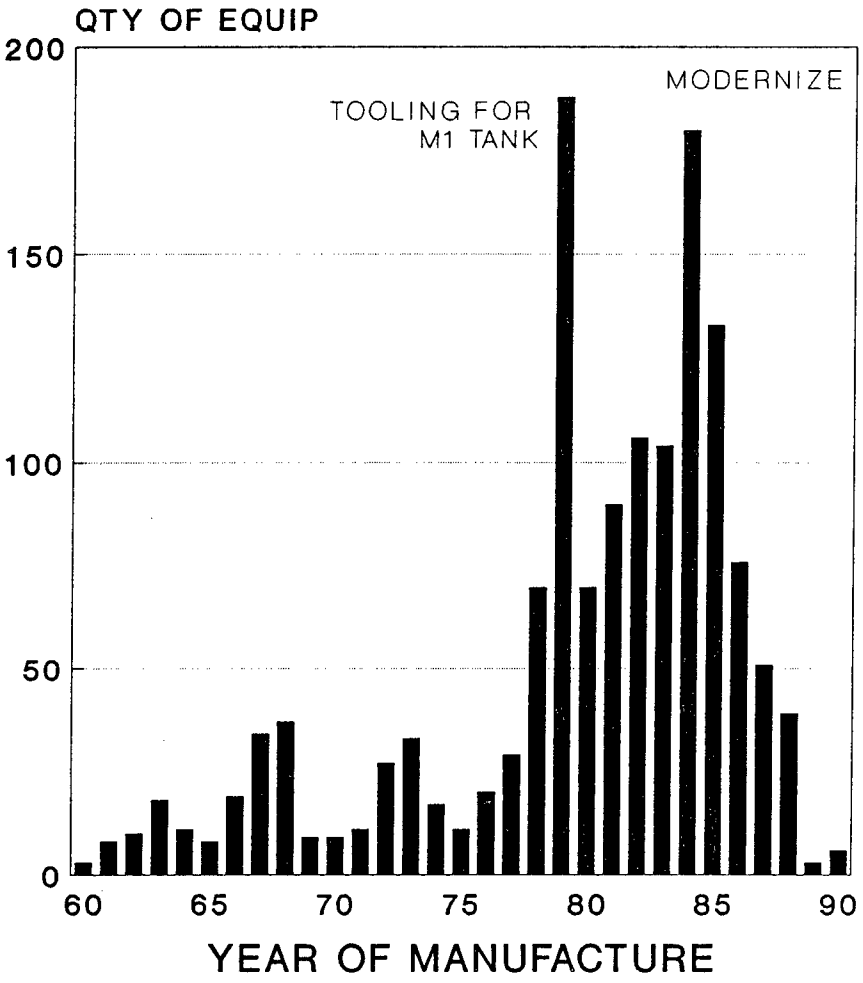
INVENTORY TRENDS OF NUMERICAL CONTROL EQUIPMENT



AS OF 30 APR 1991

This past year, the Army inventory of numerically controlled machine tools has increased by one percent. The number of NC machine tools installed in metalworking plants in private industry in America has more than doubled in the last six years according to the 14th American Machinist Inventory. The Army inventory of NC equipment was increasing at a rate of approximately 13 percent per year from 1983 through 1985. In 1986, however, the rate of increase as shown on the graph above drops to approximately 8 percent.

AGE DISTRIBUTION OF NC EQUIPMENT



AS OF 30 APR 1991

The average age for NC machines is 10 years. The above chart indicates the quantity of NC machines purchased in a particular year. The purchase of machine tools to gear up for the production of the M1 tank contributed to the spike in 1979. The spike in 1984 was caused by the purchase of machine tools for modernization of several ammunition metal parts facilities and REARM programs to modernize arsenals at Rock Island, IL and Watervliet, NY. The figures for the years 1987 and 1990 do not fully reflect the actual situation for reasons previously discussed on page 5.

SECTION V

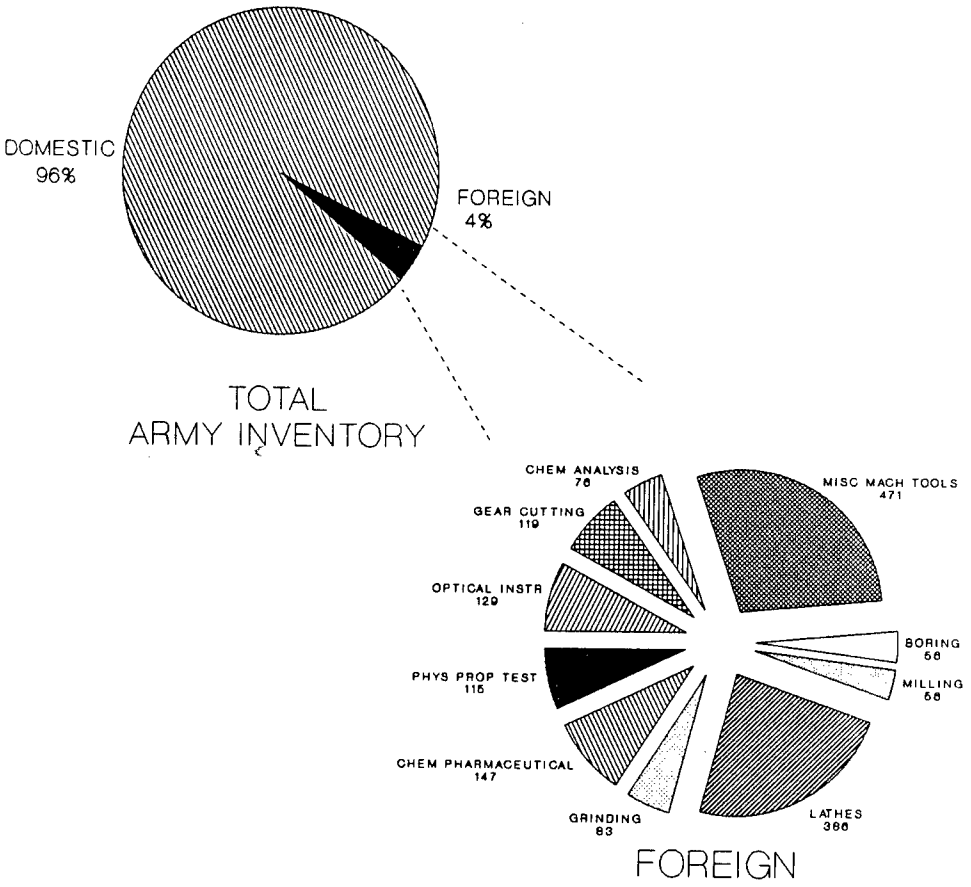
FOREIGN MACHINE TOOLS IN THE ARMY INVENTORY

The information provided in this section represents quantities and sources of the foreign equipment in the Army inventory. To obtain this information, the Commercial and Government Entity (CAGE) Code is used as a reference. This is a code assigned to a contractor or manufacturer by the Logistics Services Center (DLSC). For some North Treaty Organization (NATO) Countries, the code is assigned by a member of NATO. When a new machine is purchased by the Army, the CAGE code for the contractor or manufacturer is loaded with the machine information into the DIPEC database. It is this code that has been used in the determination of the country of origin for the machine tools in this study. Parts for a specific machine may be manufactured in many locations around the world, only to be assembled in another country. The analysis in this chapter attempts only to give a broad overview of the origin and types of foreign equipment in the Army inventory.

There has been increasing concern in the Government over the past several years regarding the supportability of foreign purchased machine tools in our industrial base, should a national emergency occur. In fact, there is often difficulty obtaining replacement parts for foreign machine tools in peacetime. The number of foreign machine tools in the mobilization base likely increase in the future and compound this concern. Congress has addressed this concern in the passage of the 1987-1989 Appropriation and 1989 Authorization Acts. Federal Acquisition Regulation (FAR) 225.70 implements the provisions of the legislation. It restricts the purchase of certain classes of machine tools to U.S. or Canadian manufacturing origin when the machine tool is being acquired for use in any Government-owned facility or property under control of the DoD.

The FAR defines foreign source machines to be those machine tools where the costs of its U.S. Components are less than or equal to 50 percent of the cost of all components. Although this definition seems straightforward, in practice, it is not always clear what is and what is not foreign. There have been a number of instances where the FAR clause was misinterpreted as applying to the contract price, rather than the price of all components. In fact, transportation, assembly, marketing and other similar costs must be excluded.

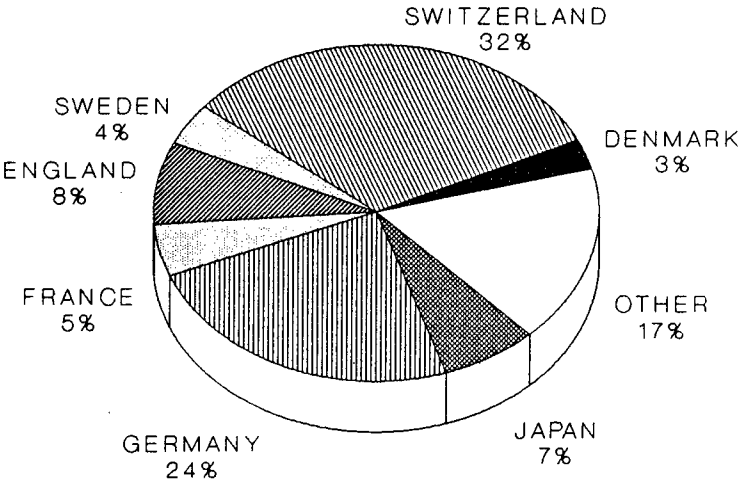
TYPES OF FOREIGN MACHINE TOOLS IN THE ARMY INVENTORY



The pie chart on the upper left, shows the vast majority of the 40,228 machine tools in the Army inventory were purchased from domestic manufacturers. The pie chart on the right provides a quantity breakout of the 4%, or 1638 pieces, of foreign equipment in the Army inventory. This figure is up from 1,458 last year or 12.3 percent. The total IPE (41,223 to 40,228) is down 2.5 percent. This is not a good indicator for US made machine tools.

The largest single class of machine tools purchased from foreign manufacturers is the lathe. The miscellaneous machine tool category is made up of many diverse classifications of IPE to include: drilling and tapping, welding, punching, presses, and special ammunition ordnance type equipment. Machines were classified in the miscellaneous category when their individual IPE classification did not exceed fifty in number.

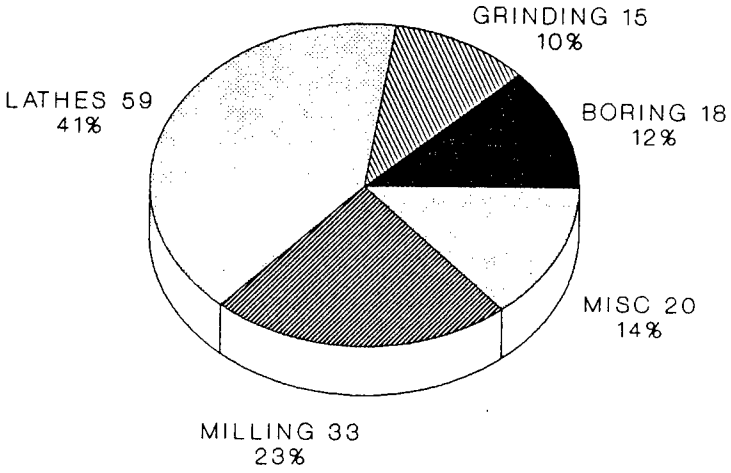
SOURCES OF FOREIGN MACHINE TOOLS IN THE ARMY INVENTORY



AS OF 30 APR 1991

Switzerland has manufactured the greatest share of our foreign machine tool inventory. They sold us many of our foreign machining centers, boring machines, and lathes. Switzerland went down however, from 37% last year to 32% this year. A reason for this could be that we are excessing a lot of automatic lathes, and gear making machines used for mechanical time fuzes. Germany also had a substantial share of our foreign machine tool market, selling us drilling and tapping equipment. Countries which fall into the "other" category in the chart above include Belgium, Italy, China, and Austria.

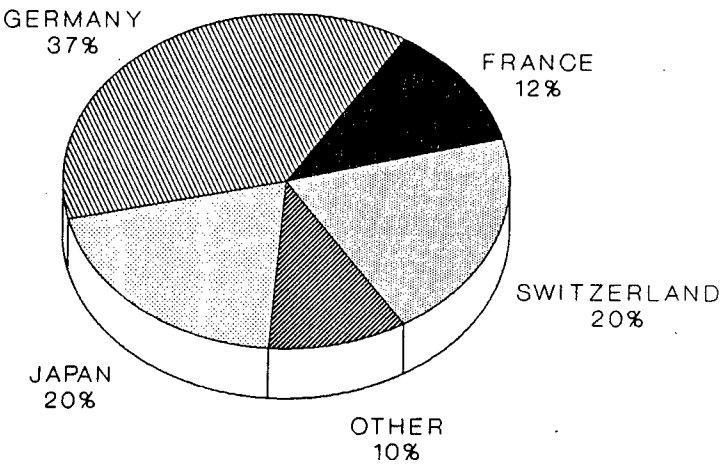
TYPES OF FOREIGN NC MACHINE TOOLS IN THE ARMY INVENTORY



AS OF 30 APR 1991

Of the 1,485 items of Numerical Control Industrial Plant Equipment (IPE) mentioned in Section IV, 145 of them are from foreign manufactures or approximately 10 percent of the Army NC inventory. This is higher than the 4 percent foreign inventory of all Army IPE. More than half the foreign NC machines are lathes and milling machines. The most significant increase from last year was lathes (37 to 59).

FOREIGN SOURCES OF NC MACHINE TOOLS IN THE ARMY INVENTORY



AS OF 30 APR 1991

The sources for the 145 items of foreign origin NC equipment in the Army inventory are shown above, and Germany has manufactured the largest share. Japan and Switzerland manufactured nearly all the NC boring equipment. Germany, Japan, and France manufactured nearly all the NC lathes. Germany and Switzerland manufactured nearly all the NC milling machines in the Army inventory.

SECTION VI

INDUSTRIAL PRODUCTION

CAPACITY UTILIZATION

Industrial production for the entire economy fell 0.3 percent in March, 1991 following declines of 0.9 percent and 0.5 percent in the first 3 months of the year, according to Federal Reserve Statistics. As noted on the tables on the opposite page, output for the metalworking sectors of the economy, however, remained essentially stable at an index (1987 = 100) of 109.4. Capacity-utilization percentage for March fell to 75.5 percent of theoretical total for metalworking, compared to 78.7 percent for the economy as a whole.

LEAD TIMES

Lead time is the period between which the order is received by the manufacturer and the machine is received by the purchaser. Lead time is a built in characteristic of the machine tool industry and is dependent on many factors which include the size and complexity of the machine, the individual manufacturer's characteristics, and the business cycle. In slack periods, machines will be delivered relatively quickly. However, in prosperous times, a backlog can arise which can double or triple lead time.

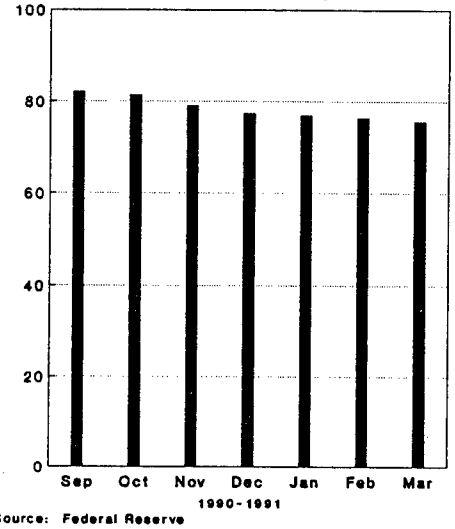
These factors combined make lead time estimation very difficult. Further, a constantly changing market will invalidate lead time estimates quickly. However, metalcutting and metalforming machines will generally have a longer lead time under any conditions than welding and testing/measuring machines, which will generally have the shortest lead time. Heat treat machines will usually fall between. According to the Office of General Industrial Machinery, Capital Goods, and Industrial Construction of the U.S. Department of Commerce, the current average production lead time to delivery is 9 to 12 months for small to medium size general purpose machine tools and 12 to 18 months for the larger general purpose machine tools. More complex machines such as machining centers have a lead time of approximately 12 to 18 months. These leadtimes have remained stable since last year's Vintage Study.

In addition to the aforementioned considerations, the Government must let the contract. The administrative lead time associated with this process can run from a minimum of 6 months up to 12 months. This means the cumulative lead time to let a contract and wait for the manufacture of the machine could be up to 30 months.

CAPACITY UTILIZATION

% of theoretical max

Composite of metalworking industries

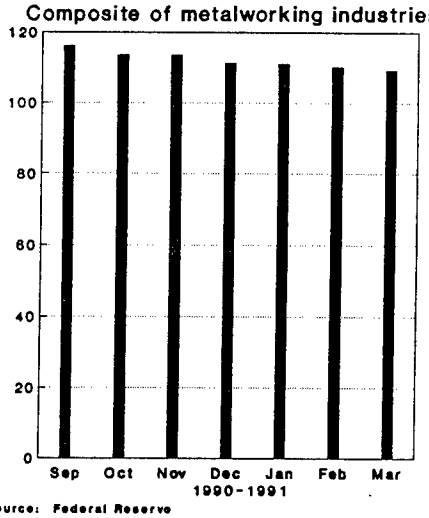


Source: Federal Reserve

PRODUCTION INDEX

Seasonally adj. 1987 = 100

Composite of metalworking industries



Source: Federal Reserve

SECTION VII

REPLACEMENT DATA

Replacement factors for metalworking, metalcutting, special tooling, and special test equipment are provided in Appendix C. They are based on an average price index provided by the U.S. Department of Labor, Bureau of Labor Statistics.

APPENDICES

APPENDIX A

CONDITION CODES

CODE	BRIEF DESCRIPTION	EXPANDED DESCRIPTION
E1	Used-Reconditioned-Excellent	Used property, but repaired or renovated and in excellent condition
O2	Used-Usable Without Repairs-Good	Used property, but in still in good condition with considerable use left before any important repairs would be required
O3	Used-Useable Without Repairs-Fair	Used property which is still in fair condition and usable without repairs; however, somewhat deteriorated, with some parts (or portion) worn or should be replaced.
O4	Used-Useable Without Repairs-Poor	Used property which is still useable without repairs, but in poor condition and undependable or uneconomical in use. Parts badly worn or deteriorated.
R1	Used-Repairs Required-Excellent	Used property, still in excellent condition, but minor repairs required (repairs would not cost more than 10% of acquisition cost).
R2	Used-Repairs Required-Good	Used property, in good condition but considerable repairs required. Estimated cost of repairs would be from 11% to 25% of acquisition cost.
R3	Used-Repairs Required-Fair	Used property, in fair condition but extensive repairs required. Estimated repair costs would be from 26% to 40% of acquisition cost.
R4	Used-Repairs Required-Poor	Used property, in poor condition and requiring major repairs. Badly worn, and would still be in doubtful condition of dependability and uneconomical to use if repaired. Estimated repair costs from 41% to 65% of acquisition cost.

APPENDIX B

Federal Supply Classes (FSCs) Included in the Five Major Subclassifications of Industrial Plant Equipment (IPE)

METALCUTTING

FSC	
3405	Saw and Filing Machines
3408	Machining Centers and Way Type Machines
3410	Electrical and Ultrasonic Erosion Machines
3411	Boring Machines
3412	Broaching Machines
3413	Drilling and Tapping Machines
3414	Gear Cutting and Finishing Machines
3415	Grinding Machines
3416	Lathes
3417	Milling Machines
3418	Planers and Shapers
3419	Miscellaneous Machine Tools

WELDING

3431	Electric Arc Welding Equipment
3432	Electric Resistance Welding Equipment
3433	Gas Welding, Heat Cutting and Metalizing Equipment
3436	Welding Positioners and Manipulators
3438	Miscellaneous Welding Equipment

METAL FORMING

3422	Rolling Mills and Drawing Machines
3441	Bending and Forming Machines
3442	Hydraulic and Pneumatic Presses, Power Driven
3443	Mechanical Power Presses
3445	Punching and Shearing Machines
3446	Forging Machinery and Hammers
3447	Wire and Metal Ribbon Forming Machines
3448	Riveting Machines

HEAT TREAT AND FURNACES

3424	Metal Heat Treating and Nonthermal Treating Equipment
4430	Industrial Furnaces, Kilns, Lehrs, and Ovens

MECHANICAL TESTING AND MEASURING DEVICES

6635	Physical Properties Testing Equipment

APPENDIX C

PRODUCTION EQUIPMENT REPLACEMENT FACTORS
As of April 1991

YEAR OF ACQUISITION	METALWORKING MACHINERY EQUIPMENT*	METAL CUTTING & METAL FORMING MACHINE TOOLS**	SPECIAL TOOLING ***	SPECIAL TEST EQUIPMENT****
1991	1.00	1.00	1.00	1.00
1990	1.03	1.03	1.02	1.02
1989	1.07	1.08	1.05	1.18
1988	1.11	1.14	1.08	1.22
1987	1.15	1.19	1.10	1.24
1986	1.16	1.22	1.11	1.26
1985	1.18	1.25	1.13	1.28
1984	1.21	1.28	1.15	1.30
82/83	1.25	1.32	1.19	1.39
80/81	1.41	1.50	1.33	1.59
78/79	1.77	1.98	1.68	1.85
76/77	2.12	2.48	2.02	2.07
74/75	2.54	3.00	2.42	2.42
72/73	3.30	3.97	3.13	2.83
70/71	3.50	4.27	3.33	2.96
68/69	3.82	4.69	3.64	3.17
66/67	4.14	5.06	3.93	3.35
64/65	4.48	5.69	4.25	N/A
60/63	4.70	6.19	4.46	N/A
57/59	5.00	6.75	4.76	N/A
55/56	5.68	7.81	5.41	N/A
52/54	6.37	8.74	6.06	N/A
49/51	7.21	10.61	6.86	N/A
46/48	8.53	13.37	8.11	N/A
41/45	10.18	N/A	N/A	N/A
39/40	10.69	N/A	N/A	N/A
38-PRIOR	12.49	N/A	N/A	N/A

* The Metalworking Machinery and Equipment column represents machine tools, power driven hand tools, welding machines and equipment, industrial process furnaces and ovens, cutting tools and accessories, and abrasive products.

** Metal Cutting and Metal Forming Machine Tools are subgroups of the Metalworking Machinery and equipment group. They include conventionally and numerically controlled machine tools and parts for same.

*** Special Tooling as used in this column means jigs, dies, fixtures, molds, patterns, taps, gauges, and other equipment which are of such a specialized nature that without substantial modification or alteration their use is limited to the development or production of particular supplies or performance of particular services (FAR 45.101).

**** The Special Test Equipment column applies to single or multi-function test equipment, measuring and controlling devices, physical properties testing and optical and analytical instruments engineered, designed, fabricated or modified to accomplish special purpose testing. Special Test Equipment consists of items or assemblies of equipment including standard or general purpose item or components that are interconnected and interdependent so as to become a new functional entity for special testing purposes (FAR 45.101).

NOTES:

a. Acquisition cost times replacement factor equals replacement value.

b. Because of the continuous technological improvement in machine tools and the increasing number of "custom built" machines, reliable wholesale price indexes (which are intended to measure price changes not influenced by changes in quality, product mix, etc.) are difficult to develop. Recognizing this fact, the data should be used with caution. If available, new replacement prices should be used.

c. Changes in calculating the Finished Goods Price Index were published by the U.S. Department of Labor, Bureau of Labor Statistics in January l988 which affected the calculations for developing the replacement factors. IEA developed new replacement factors based upon the indexes provided and previous available data. Replacement factors are based on an average price index thru April 1991. Because of the insignificant changes in the replacement factors, IEA provides this update only twice a year.